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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of A. MARTIN	)	Examiner: T. McEVOY
Serial No.: 10/542,975	)	Art Unit: 3731
Filed: July 21, 2005	)	Confirmation: 1970
For: **MAGNETIC RESONANCE COMPATIBLE STENT**	)	
Date of Last Office Action: March 9, 2010	)	
Attorney Docket No.: US030017US2/ PKRZ 201366US01	)	Cleveland, OH 44114 February 10, 2011

APPEAL BRIEF

Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is an Appeal from the Final Rejection of July 21, 2010.

A Notice of Appeal was filed December 14, 2010.

The Notice of Appeal fee of $540.00 was paid September 25, 2009

The 37 CFR 41.20(b)(2) Appeal Brief submission fee of $540.00 was paid on November 19, 2009.

CERTIFICATE OF ELECTRONIC TRANSMISSION

I certify that this APPEAL BRIEF and accompanying documents in connection with U.S. Serial No. 10/542,975 are being filed on the date indicated below by electronic transmission with the United States Patent and Trademark Office via the electronic filing system (EFS-Web).

Feb 11 2011 — Patricia A Heim

Date — Patricia A. Heim

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Thomas M. Lundin, Reg. No. 48,979

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(i) REAL PARTY IN INTEREST

The Real Party in Interest is the Assignee, KONINKLIJKE PHILIPS ELECTRONICS, N.V.

(ii) RELATED APPEALS AND INTERFERENCES

None

(iii) STATUS OF CLAIMS

Claims 13, 16, and 19-27 are pending in this application.

Claims 1-12, 14-15, and 17-18 have been cancelled.

Cancelled claim 12 stands rejected under 35 U.S.C. § 103 as being obvious over Lau (US 6,066,168) as modified by Pacetti (US 2002/0188345).

Claim 13 does not stand rejected on art and is understood to contain allowable subject matter.

Claims 16, 19, and 20 stand rejected under 35 U.S.C. § 103 as being obvious over Lau as modified by Pacetti.

Independent claim 21 stands withdrawn as being drawn to a non-elected species.

Dependent claims 22-27, which depend from claim 13, stand withdrawn as being directed to a non-elected species, but will stand allowed upon allowance of their generic parent claim 13.

The rejection of all claims including 13 (if rejected), 16, 19, and 20 is being appealed.

(iv) STATUS OF AMENDMENTS

No amendments have been submitted subsequent to the Final Rejection of July 21, 2010.

(v) SUMMARY OF CLAIMED SUBJECT MATTER

13. A magnetic resonance compatible stent **{50}** for use in intravascular therapy **{p. 1, l. 7-9; p. 2, l. 4, 9-10}**, the stent comprising:

a plurality of electrically conductive elements **{90}** arranged in a generally tubular structure, the conductive elements comprising generally diagonally arranged struts **{90}** with respect to a central axis **{60}** of the stent **{p. 7, l. 2 – p. 8, l. 4; Figs 2-4B}**, the conductive elements comprising:

a plurality of loops **{s1, s2, s3, s4, Fig. 3B; 110}** disposed about a central axis of the stent **{p. 8, l. 25-30; Figs 2-4B}**; and

a plurality of linking members **{90, B-B, A, 120}** for joining the loops such that the loops and linking members form a generally tubular structure around the central axis of the stent **{p. 8, l. 25 – p. 9, l. 2; p. 9, l. 17-20; p. 10, l. 3-9; Figs 2-4B}**; and

a plurality of non-conductive connector nodes **{95}** disposed among the conductive elements **{90}** for directing currents induced by RF signals in an examination region of a magnetic resonance apparatus to flow in the conductive elements such that the currents flowing in adjacent conductive elements cancel each other and a net current flowing in the stent is substantially minimized **{p. 8, l. 25 – p. 9, l. 2; p. 9, l. 18-20; p. 10, l. 3-9; Figs 2, 3A, 4B}**;

wherein the loops and linking members are connected within the non-conductive connector nodes such that the current flowing through adjacent loops substantially cancel each other **{p. 8, l. 28-30}**.

16. A stent **{50}** comprising:

a plurality of electrically conductive struts **{90}** connected by a plurality of insulating nodes **{95}** to define a diamond-shaped mesh of the conductive struts, the plurality of conductive struts and insulating nodes being disposed in a cylinder to define a generally tubular diamond-shaped conductive mesh, the conductive struts being electrically connected to define a plurality of loops **{s1, s2, s3, s4, Fig. 3B; 110}** of struts in a zig-zag pattern extending peripherally around the cylinder, each loop being electrically connected to each adjacent neighboring loop **{A,**

B-B, 120} in such a manner that currents **{i1, i2, i3, i4, Fig. 3B}** induced in the zig-zag loops during a magnetic resonance examination flow in opposite peripheral directions and are substantially cancelled by one another **{p. 8, l. 9-22; p. 10, l. 3-9; Figs 2, 3A, 3B, 4B}**.

19. The stent according to claim 16, wherein each zig-zag loop **{s1, s2, s3, s4}** is electrically connected **{A, B-B}** to each neighboring zig-zag loop only once and mechanically connected at a plurality of locations by a plurality of the non-conductive nodes. **{p. 8, l. 17 – p. 9, l. 22; Fig 2, 3A}**

20. The stent according to claim 16, wherein each zig-zag loop **{110}** is electrically connected to its neighboring zig-zag loop alternately at 90° intervals. **{p. 10, l. 3-9; Fig. 4B}**

(vi) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 12, 16, 19, and 20 distinguish patentably and unobviously, in the sense of 35 U.S.C. § 103 over Lau as modified by Pacetti.

(vii) ARGUMENT

A. The Patentability of Claim 12 is Not at Issue

Claim 12 was cancelled in the Amendment of March 6, 2009. Accordingly, whether claim 12 would or would not have been patentable over Lau as modified by Pacetti is not material to the present appeal.

B. Claims 13 and 22-24 & 27 Distinguish Patentably Over the References of Record

There being no outstanding rejection against claim 13, it is understood that claim 13 is now in condition for allowance. With the allowance of generic claim 13, the applicant is entitled to the allowance of the non-elected species claims dependent therefrom.

Accordingly, it is submitted that claims 13, 22-24, and 27 are now in condition for allowance.

C. Claims 13, 21-24 & 27 Distinguish Patentably Over the References of Record

Lau discloses a stent in which the peripheral or circumferential loops or rings are S-shaped. Electrically (but not mechanically) this structure is the same as the structure of Figure 4 of Pacetti. From the discussion in paragraphs [0033]-[0034] of Pacetti, it appears that the construction of Figure 4 should have been labeled "prior art". Specifically, Pacetti is concerned with addressing the Faraday cage effect in metallic stents (paragraph [0007]). Current flowing through the rings 40 of Figure 4 of Pacetti, hence the currents flowing through the cylindrical elements 12 of Lau, are the most problematic (Pacetti, paragraph [0033]). However, the currents flowing in the cells 44 of Figure 4 of Pacetti are also problematic. Pacetti solves the problem of currents flowing in the rings or loops and cells by creating a discontinuity 52 through the electrical elements in such a manner as to eliminate a complete circuit or flow path through each of the rings 40 and each of the cells 44 (Pacetti, Figure 5, paragraph [0035]). That is, the clear teachings of Pacetti is that electrical discontinuities should be formed such that no current travels around the rings or

around the cells by virtue of the discontinuities opening each and every one of these circuits. It is submitted that if one were to modify Lau by the fair teachings of Pacetti, one would place a large number of discontinuities 52 into the cylindrical elements 12 and the interconnecting elements 13 of Lau in such a manner that currents would not travel around any of the cylindrical elements 12 or the cells (unlabeled) of Lau.

The Examiner was courteous enough to supply a drawing of what he believes the current flow would look like in Figure 11 of Lau. However, there are two problems with the Examiner's drawing.

First, if one were to modify Lau as taught by paragraph [0035] and Figure 5 of Pacetti, there would be electrical discontinuities scattered throughout the drawings in such a manner that the current could not flow. More specifically, there would be sufficient and scattered discontinuities which would prevent the current from flowing from any starting point through conductors and come back to the starting point in a current loop. Stated another way, there would be scattered discontinuities such that there are no complete circuits and no current flow.

Second, the Examiner's drawing is not correct. The Examiner proposes a DC current model when he should have used a high frequency AC model. The currents induced in the stents of Lau and Pacetti are induced by the radio frequency pulses of an MRI imaging system. That is, high power, high frequency RF (alternating) pulses are applied from all peripheral directions, causing complex current flow patterns. Specifically, the RF signal causes eddy currents which are currents flowing in closed loops of conductive material. Again, this is why Pacetti proposes to place an electrical discontinuity in every potential closed loop of electrically conductive material in order to prevent such eddy current flows.

The Examiner's drawing assumes a DC current in which the positive pole of a battery is connected with the point on the bottom ring labeled by the Examiner and a point at the upper end of the construction is connected with the negative pole of the same battery. However, in an MRI system, such a DC current flow as proposed by the Examiner is not induced, although, if it were, the Pacetti solution would block the flow of such a DC current as well.

Claim 13 calls for current to flow in the conductive elements. By distinction, Pacetti teaches that discontinuities should be placed in the conductive elements such that current does not flow. Moreover, claim 13 calls for the currents to

flow in adjacent conductive elements in such a manner that the currents flowing in adjacent conductive segments cancel each other. In Lau as modified by Pacetti, there are no currents flowing, much less currents flowing in adjacent elements, much less currents flowing in adjacent loops substantially cancel each other. Indeed, the clear teaching in paragraph [0033] of Pacetti is that current should not flow, and in particular not flow around the loops or rings.

Further, claim 13 calls for the loops and linking members to be connected with non-conductive connector nodes. Lau has no non-conductive connector nodes. Pacetti does not cure this shortcoming of Lau. In Pacetti, the discontinuities 52 are, for example, laser-made cuts which are filled by a non-conducting material such as an adhesive or polymer 54 (Pacetti, paragraph [0036]). It should be noted that the discontinuities 52 of Pacetti are in mid-portions of individual struts 49. The non-conducting material, such as the adhesive or polymer 54 of Pacetti, does not connect loops or rings with other loops or rings or connect loops or rings with linking members or struts.

Accordingly, it is submitted that claim 13 and dependent claims 22-24 and 27 distinguish patentably and unobviously over Lau as modified by Pacetti.

D. Claims 16, 19, 20, 25 & 26 Distinguish Patentably Over the References of Record

Claim 16 calls for a plurality of electrically conductive struts which are connected by a plurality of insulating nodes to define a diamond-shaped mesh of the conductive struts.

Neither Pacetti nor Lau disclose a diamond-shaped mesh. First, the stent of Lau even in its fully expanded position (Figures 2 and 3) still defines cells of a wavy configuration, not diamond-shaped cells. Similarly, as shown in Figures 2 and 3 of Pacetti, even when the stent of Pacetti is fully expanded, its cells are still generally M- or W-shaped, not diamond-shaped. Even if the stents of Lau or Pacetti were opened out to their fullest maximum extent, which is not how stents are used, the cells might, at best be elongated rectangles (or possibly slightly hourglass shaped). Thus, neither Lau, nor Pacetti, nor the combination thereof disclose or teach a diamond-shaped mesh.

Further, claim 16 calls for the electrically-conductive struts to be connected by insulating nodes to define such diamond-shaped mesh. In Lau, there are no insulating nodes. In Pacetti, the struts 49 have non-conductive material filled cuts mid-way therealong. There are no insulating nodes which connect the struts 49 or connectors 50 to each other.

Claim 16 also calls for the struts in the zig-zag pattern to extend around the cylinder and for currents to flow in such loops. Moreover, such loops are required to be interconnected such that the current flows through neighboring loops peripherally in opposite directions. By contrast, in Pacetti, there are no current supporting loops. Rather, Pacetti requires discontinuities 52 which block current flow in cylindrical rings 40 and around cells 44 (Paragraph [0033], [0035]). Thus, rather than creating loops which carry current in opposite directions, Pacetti teaches against such a construction in favor of discontinuities which create open circuits and prevent any current flow. Pacetti fails to suggest directing current in opposite directions through neighboring loops or rings. Lau fails to cure this shortcoming of Pacetti.

Further, the Examiner's rejection is based on an erroneous understanding of the current flows which would occur in the stent of Lau as modified by Pacetti. First, the Figure on page 5 of the Final Rejection assumes a DC current, such as would be generated if one pole of a DC battery were connected with one end of the illustrated stent and the other pole were connected with the other end. Such DC currents are not applied in MRI machines. Rather, high-frequency radio fields induce high-frequency currents which flow in eddy current loops in metal structures within the MRI imaging region. Further, the drawing on page 5 of the Final Rejection fails to modify the Lau stents with the fair teachings of Pacetti (note Paragraphs [0033] and [0035]) that electrical discontinuities should be defined in the loops and connectors such that the illustrated currents cannot flow. Because the Examiner's rejection is predicated on an erroneous understanding of the references, it is submitted that the Examiner's rejection must fail.

Accordingly, it is submitted that claim 16 and claims 19, 20, 25, and 26 dependent therefrom distinguish patentably and unobviously over the references of record.

E. Claim 19 Distinguishes Patentably Over the References of Record

Claim 19 calls for each zig-zag loop to be electrically connected to each neighboring zig-zag loop only once. This finds antecedent basis in Figure 3A and Figure 3B in the connection between loops s1 and s2 at B, the electrical connection between loops s2 and s3 only at point A, the electrical connection between loops s3 and s4 only at point B, etc. By contrast, in Pacetti, there are multiple electrical connectors 50 between each adjacent loop. Lau does not cure this shortcoming of Pacetti. Like Pacetti, Lau has numerous electrical connectors 13 between adjacent loops.

Further, claim 19 further calls for the zig-zag loop to be connected mechanically at a plurality of locations by a plurality of non-conductive connector nodes. In Lau, there are no non-conductive connector nodes disclosed. In Pacetti, the laser cuts or other discontinuities 52 mid-way along the struts 49 are filled with a non-conducting material. However, these non-conductive material-filled nodes do not connect the rings or loops 40 of Pacetti with each other. Rather, the only interconnection between the rings 40 of Pacetti are the electrical connectors 50.

Accordingly, it is submitted that claim 19 distinguishes patentably over the references of record.

F. Claim 20 Distinguishes Patentably Over the References of Record

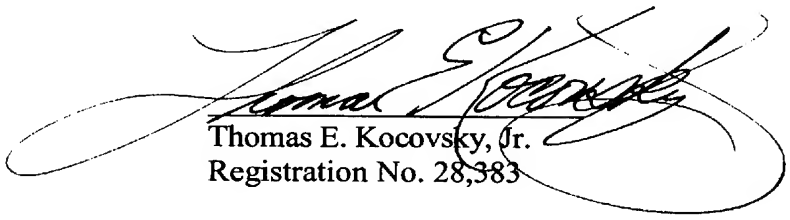
Claim 20 calls for connecting each zig-zag loop to its neighboring loop at 90° intervals. This finds antecedent basis in Figure 4B of the present application. The Examiner acknowledges that claim 20 is not met by Pacetti and refers the applicant to Figures 8-10 of Lau as curing this shortcoming. Figures 8-10 of Lau do not have connectors at 90° intervals. The connectors 13 of Figures 8-10 of Lau are at 360° intervals, 180° intervals and 120° intervals, respectively.

Accordingly, it submitted that claim 20 distinguishes patentably and unobviously over the references of record.

G. Conclusion

For the reasons set forth above, it is submitted that claims 13, 16, 19, 20, and 22-25 distinguish patentably and unobviously over the references of record. An early reversal all rejections is requested.

Respectfully submitted,



Thomas E. Kocovsky, Jr.
Registration No. 28,383

FAY SHARPE LLP
The Halle Building, 5th Floor
1228 Euclid Avenue
Cleveland, OH 44115-1843
Telephone: 216.363.9000 (main)
Telephone: 216.363.9122 (direct)
Facsimile: 216.363.9001
E-Mail: tkocovsky@faysharpe.com

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(ix) CLAIMS APPENDIX

1-12. (Cancelled)

13. (Rejected) A magnetic resonance compatible stent for use in intravascular therapy, the stent comprising:

a plurality of electrically conductive elements arranged in a generally tubular structure, the conductive elements comprising generally diagonally arranged struts with respect to a central axis of the stent, the conductive elements comprising:

a plurality of loops disposed about a central axis of the stent; and

a plurality of linking members for joining the loops such that the loops and linking members form a generally tubular structure around the central axis of the stent; and

a plurality of non-conductive connector nodes disposed among the conductive elements for directing currents induced by RF signals in an examination region of a magnetic resonance apparatus to flow in the conductive elements such that the currents flowing in adjacent conductive elements cancel each other and a net current flowing in the stent is substantially minimized;

wherein the loops and linking members are connected within the non-conductive connector nodes such that the current flowing through adjacent loops substantially cancel each other.

14-15. (Cancelled)

16. (Rejected) A stent comprising:

a plurality of electrically conductive struts connected by a plurality of insulating nodes to define a diamond-shaped mesh of the conductive struts, the plurality of conductive struts and insulating nodes being disposed in a cylinder to define a generally tubular diamond-shaped conductive mesh, the conductive struts being electrically connected to define a plurality of loops of struts in a zig-zag pattern extending peripherally around the cylinder, each loop being electrically connected to each adjacent neighboring loop in such a manner that currents induced in the zig-zag

loops during a magnetic resonance examination flow in opposite peripheral directions and are substantially cancelled by one another.

17-18. (Cancelled)

19. (Rejected) The stent according to claim 16, wherein each zig-zag loop is electrically connected to each neighboring zig-zag loop only once and mechanically connected at a plurality of locations by a plurality of the non-conductive connector nodes.

20. (Rejected) The stent according to claim 16, wherein each zig-zag loop is electrically connected to its neighboring zig-zag loop alternately at 90° intervals.

21. (Withdrawn) A stent which inhibits interaction with an MR system, the stent comprising:

two conductive expandable mesh layers with an elastic layer of non-conductive material in between, each mesh layer including a plurality of electrically conductive elements connected to define a conductive pattern along which currents induced by the MR system flow, the conductive patterns of the two conductive mesh layers overlaying each other and being configured such that the current induced in one of the conductive patterns is equal and opposite to the current induced in the conductive patterns of the other layer such that the currents cancel each other.

22. (Withdrawn) The stent according to claim 13, wherein the plurality of electrically conductive elements are disposed in first and second layers.

23. (Withdrawn) The structure according to claim 22, further including:

an elastic layer of non-conductive material disposed between the first and second layers.

24. (Withdrawn) The stent according to claim 23, wherein the conductive elements in the second layer overlay the conductive elements in the first layer and the non—conductive connector nodes connect the conductive elements of the first and second layers such that the currents flowing in the conductive elements of the second layer cancel the currents flowing in the conductive elements of the first layer.

25. (Withdrawn) The stent according to claim 16, further including:

a plurality of second electrically conductive struts connected by a plurality of second insulating nodes to define a diamond-shaped mesh of the second conductive struts, the plurality of second conductive struts and second insulating nodes being disposed in a second cylinder to define a second generally tubular diamond-shaped conductive mesh, the second conductive struts being electrically connected to define a plurality of second electrically conductive loops of second conductive struts in a zig zag pattern extending peripherally around the second cylinder, each second loop being electrically connected in such a manner that currents induced in the second loops during a magnetic resonance examination flow in opposite peripheral directions to currents flowing in adjacent loops of the first cylinder and are substantially cancelled by one another.

26. (Withdrawn) The stent according to claim 25, further including:

an elastic layer of non-conductive material disposed between the first and second cylinders.

27. (Withdrawn) The stent according to claim13, further comprising:

first and second layers of the diamond-shaped mesh with an elastic layer of non-conductive material in between, each conductive mesh layer including a plurality of the electrically conductive struts connected by the insulating nodes to define a conductive pattern along which the currents induced by the MR system flow, the conductive patterns of the first and second conductive mesh layers overlaying each other and being configured such that the current induced in the conductive

pattern of the first layer is equal and opposite to the current induced in the conductive pattern of the second layer such that the currents cancel each other.

(x) EVIDENCE APPENDIX

None

(xi) RELATED PROCEEDINGS APPENDIX

None